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(54) SAFETY DEVICE FOR ELECTROSTATIC COATING INSTALLATIONS

(71) We, AIR INDUSTRIE (formerly Tunzini-Ameliorair Thermique-Aerailique-Mecanique (T.A.M.)), a French Body Corporate of 19 Avenue Dubonnet, Courbevoie (Hauts-de-Seine) France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a device for preventing risk of fire or explosion due to electric sparks which may be produced at the suspension means of metallic objects intended to be coated in an electrostatic coating installation.

In installations which utilize an electric field created between two electrodes in an inflammable medium, it is important that the electrical contacts should be made with care in order to avoid sparks at the said contacts. These sparks may in fact be the cause of fire or explosions.

This is especially the case in electrostatic coating installations. These latter generally comprise one or more electrodes which are brought up to a high potential, of about a hundred kilovolts for example, and the metallic objects to be coated are attached to a conveyor by suspension means, e.g. hooks, the said conveyor being connected to earth.

The coating product, divided into fine particles may constitute an inflammable mixture with air, and a spark can effectively set fire to or cause the explosion of this mixture.

In order to prevent sparks in the neighbourhood of the electrodes, a resistive protection element is placed in series between an electrode itself and the high-tension supply.

Unfortunately, a risk of sparking also exists at other places, more particularly at the place where the object to be coated is suspended. A bad contact can in fact exist between a metallic object to be coated and its suspension means, which has become partly covered with paint or powder during the course of a previous passage into the coating booth. In general, the suspension means, e.g. hooks, are not sufficiently well

cleaned after passing through the coating installation, so that after a number of successive passages, they are covered with a crust which is sufficiently insulating to prevent electric contact between the metallic object to be coated and the earthed conveyor.

In consequence, an object to be coated, at the moment of its passage close to the electrodes at a high tension, acquires electric charges which accumulate on the object until the latter has a potential sufficiently high to cause the breakdown of the insulating crust between the object and the suspension means by which it is attached, the said breakdown being accompanied by a spark capable of developing sufficient energy to ignite the mixture constituted by the air and the finely divided coating product.

Certain practical measures are taken at the present time in order to minimize this risk. A first measure consists of utilizing suspension hooks provided with sharp points or edges in contact with the objects which are suspended by these hooks, so that the pressure due to the actual weight of the object has a tendency to pierce the insulating crust. A second measure consists, when this is possible, of effecting the suspension contact at a masked area of the object, the said area not being intended to be coated. A third solution consists of the application by the user of maintenance rules for the systematic cleaning of the suspension means. It will readily be understood that these measures, which are solely preventive, cannot be considered as infallible and do not prevent any accidental risk of fire or explosion.

Another possible solution consists of ensuring the maintenance of good electrical contact between the object and the conveyor by means of an instrument for measuring the electrical resistance between these latter before the parts pass into the coating booth. This device necessitates the use of brushes in rubbing contact with the object, which has the drawback that they may scratch the object. On the other hand, measurement of the resistance is not feasible if the object is already covered with a first layer of a coating product, for example a priming coat.

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The device forming the object of the invention acts without the use of members in mechanical contact with the object to be coated, so as to verify systematically that the contact is sufficiently well made between the object and its suspension means on the conveyor, in order to avoid any dangerous sparks.

From one aspect the invention provides a device for preventing risks of fire or explosion due to electric sparks which may be produced at the suspension means for metal objects intended to be coated in an electrostatic coating booth, said device being disposed in advance of the entrance to said booth and comprising means spaced from the path of said objects for inducing an electric charge on the said objects as they pass to said booth and means for detecting sparks occurring between an object and its suspension means and thereupon causing actuation of a safety device.

The invention also provides an electrostatic coating installation comprising a coating booth in which an electrostatic spraying operation can be carried out on metallic objects suspended from conveying means which serve both to pass the objects through the coating booth and also to connect the objects through their suspension means to a point of reference potential, wherein a device is provided in advance of the entrance of the coating booth for preventing the risk of fire or explosion due to electric sparks which may be produced at the suspension means for an object, said device comprising charge inducing means spaced from the path of said object for inducing an electric charge on said object and means for detecting sparks occurring between an object and its suspension means and thereupon causing actuation of a safety device.

The invention will be more clearly understood with reference to the description which follows which is given by way of example and with reference to the accompanying drawing, which represents diagrammatically an embodiment of electrical safety device according to the invention, in one of its preferred forms.

The figure shows a metallic object 3 suspended by a metal hook 2 from a conveyor 1 made entirely of metal and connected to earth. As shown, the object is assumed to be located at a position on the conveyor in advance of the entrance to the electrostatic coating booth.

In accordance with the invention, there has been provided at this point a safety device comprising a high-tension generator 5 connected to one or a plurality of ionizer electrodes 4, placed at a short distance from the object 3, together with a spark detector constituted by an antenna 6 connected to a detector-amplifier 7. The detector-amplifier

7 is connected to a safety device 8 arranged to actuate an alarm device and/or a safety device.

The operation of the device is as follows:

During its passage in front of the ionizer electrodes 4, the object 3 receives electrical charges conveyed by the ionized air. If the electrical contact between the object 3 and the hook 2 is satisfactory, these charges are naturally passed to earth without causing sparks. If the electric contact between the object 3 and the hook 2 is poor, these charges accumulate on the object until this latter is brought to a potential which can create a breakdown spark capable of piercing the insulating layer which causes the bad contact between the object 3 and the hook 2.

The signal emitted by the breakdown spark is received by the antenna 6, and transmitted to the detector-amplifier 7 which itself transmits the information to a safety device 8 permitting either a warning to be given by a light or audible signal, or the conveyor to be stopped or the spraying operation to be stopped inside the booth when the part having the defective electrical suspension contact passes into the booth.

The detector-amplifier may advantageously be provided with a means for adjusting the sensitivity of detection so as to react only to sparks which exceed a level of energy previously defined as dangerous. The value chosen for the voltage of the generator 5 is a function of the characteristics of the installation, and in particular of the capacity of the object 3. In certain cases, it is advantageously possible to utilize the high-tension source supplying the electrostatic coating booth itself for also supplying the ionizer electrodes 4 of the safety device.

The safety device is mounted in advance of the coating booth and is preferably enclosed in a small chamber, the interior of which does not offer any danger of fire or explosion.

The device according to the invention may be employed in all cases where, in an installation for coating objects by electrostatic painting or powdering, there exists a risk of fire or explosion in the vicinity of the object to be coated, this fire or this explosion being possibly caused by a spark produced at a point of bad electrical contact.

WHAT WE CLAIM IS:—

1. A device for preventing risks of fire or explosion due to electric sparks which may be produced at the suspension means for metal objects intended to be coated in an electrostatic coating booth, said device being disposed in advance of the entrance to said booth and comprising means spaced from the path of said objects for inducing an electric charge on the said objects as they pass to said booth and means for detecting

sparks occurring between an object and its suspension means and thereupon causing actuation of a safety device.

5 2. An electrostatic coating installation comprising a coating booth in which an electrostatic spraying operation can be carried out on metallic objects suspended from conveying means which serve both to pass the objects through the coating booth and
10 also to connect the objects through their suspension means to a point of reference potential, wherein a device is provided in advance of the entrance of the coating booth for preventing the risk of fire or explosion
15 due to electric sparks which may be produced at the suspension means for an object, said device comprising charge inducing means spaced from the path of said object
20 for inducing an electric charge on said object and means for detecting sparks occurring between an object and its suspension means and thereupon causing actuation of a safety device.

25 3. Apparatus as claimed in claim 1 or 2, wherein the said charge inducing means is constituted by an ionisation device.

4. Apparatus as claimed in claim 1, 2 or 3, wherein said safety device is an alarm device.

5. Apparatus as claimed in claim 1, 2 or 3, wherein said safety device is for stopping the passage of objects to be coated and/or for stopping the coating operation.

6. Apparatus as claimed in any preceding claim, wherein the charge inducing means is fed from the same high-tension generator as that supplying high-tension current for the said electrostatic coating operation.

7. Apparatus as claimed in any preceding claim, wherein said means for detecting electric sparks comprises a device having an adjustable sensitivity and hence a variable detection threshold.

8. Devices for preventing risks of fire or explosion in high-tension electrostatic coating installations, substantially as hereinbefore described with reference to the accompanying drawings.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale*

